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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|-------------|----------------------|---------------------|------------------|
| 10/813,629 | 03/31/2004 | Ryosuke Usui | 65933-084 | 3812 |
| <div>7590 12/10/2007</div> <div>MCDERMOTT, WILL & EMERY</div> <div>600 13th Street, N.W.</div> <div>Washington, DC 20005-3096</div> | | | | |
| EXAMINER | | | | |
| NGUYEN, DINH P | | | | |
| ART UNIT | | PAPER NUMBER | | |
| 2814 | | | | |
| MAIL DATE | | DELIVERY MODE | | |
| 12/10/2007 | | PAPER | | |

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/813,629

Applicant(s)

USUI ET AL.

Examiner

DILINH NGUYEN

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 September 2007.
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5, 11, 15 and 16 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1-5, 11, 15 and 16 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/S508)
Paper No(s)/Mail Date 6/6/07, 9/10/07
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-5, 11 and 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kaneshiro et al. (JP 10-284648) in view of Bergmann et al. (U.S. Pub. 2006/0017069) and further in view of Matayabas, JR. et al. (U.S. Pub. 2004/0191503).

- Regarding claims 1 and 15, Kaneshiro et al. disclose a semiconductor module comprising:

an insulating base material 5A provided with a conductor circuit;
a semiconductor element 7 formed on the insulating base material; and
an insulator 12 disposed in contact with the insulating base material and the semiconductor element;

wherein the insulating base material 5A is provided with minute projections on a surface thereof (the surface of the solder resist film is roughened) (paragraph 0012) is in contact with the insulator 12 (fig. 2 and abstract).

Kaneshiro et al. do not explicitly disclose that the projections have 1nm to 20 nm in average diameter and formed in number density of not less than $0.5 \times 10^3 \mu\text{m}^{-2}$.

However, Bergmann et al. disclose a semiconductor device comprising a plurality of nanoparticles having 10 to 50 nanometers in average diameter (paragraph 0037) in order to use for low-viscosity adhesive base compositions (paragraph 0037).

Matayabas, JR. et al. disclose a semiconductor device comprising: one or more matrix polymer having a plurality of fillers, wherein the amount of fillers is about 10 to 90 wt % (claim 27), such filler would reduce surface tension and improve adhesion.

Therefore, it would have been obvious to one having ordinary in the art at the time the invention was made to modify the device of Kaneshiro et al. by having a plurality of nanoparticles having 10 to 50 nanometers in average diameter and forming the amount of fillers about 10 to 90 wt % as taught by Bergmann et al. and Matayabas, JR. et al. in order to use for low-viscosity adhesive base compositions and such filler would reduce surface tension and improve adhesion.

- Regarding claim 2, Kaneshiro et al. disclose that the insulator 12 is a sealing resin for sealing the semiconductor element therein (fig. 2, abstract, line 19).
- Regarding claim 3, Kaneshiro et al. disclose that the insulator is an adhesive provided between the semiconductor element and the insulating base material (fig. 2).
- Regarding claims 4-5 and 16, Kaneshiro et al. disclose that the plasma treatment is performed on the insulating layer to form the unevenness on the surface of the insulating layer or to roughen the surface. This shows that, by ensuring that arithmetic mean roughness of the surface of the insulating base material 5A is $\leq 0.2 \mu\text{m}$ or desirably, $\leq 0.4 \mu\text{m}$, adhesion between the insulating base material 5A

and the sealed body 12 is enhanced (paragraphs 0033 and 0035). Therefore, a surface of the insulating base material 5A of Kaneshiro et al. would have a plurality of shaped recesses that is in contact with the insulator 12 (fig. 2). Kaneshiro et al. disclose the claimed invention except for crater-shaped recesses. It would have been obvious to one having ordinary skill in the art at the time the invention was made to form a plurality of crater-shaped recesses. A change in shape is generally recognized as being within the level of ordinary skill in the art. In re Rose, 105 USPQ 237 (CCPA 1955).

- Regarding claim 11, Kaneshiro et al. disclose that the semiconductor element 7 is a bare chip and the insulator 12 is constituted essentially of a sealing resin for sealing the bare chip 7 therein (fig. 2).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DILINH NGUYEN whose telephone number is (571)272-1712. The examiner can normally be reached on 8:00AM - 5:00PM (M-F).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2814

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Hoai v Pham/
Primary Examiner, Art Unit 2814

DLN